

## **DETAILED ACTION**

### ***Election/Restrictions***

- 1.1 Applicant's election without traverse of Group I, Claims 25-37 in the reply filed on 7/12/2010 is acknowledged.
- 1.2 Applicant canceled all non elected claims in the response received 7/12/2010 so no action by examiner is required regarding the non elected invention.

### **EXAMINER'S AMENDMENT**

- 2.1 An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.
- 2.2 Authorization for this examiner's amendment was given in a telephone interview with Dana Tangren on 9/24/2010.
- 2.3 Please amend the claims 25, 33, and 35-37 as listed below:  
  
25. (Currently Amended) A planar lightwave circuit having a core and a clad which are formed on a substrate, comprising: at least one input optical waveguide which inputs signal light; mode coupling means for coupling a fundamental mode which is part of the inputted signal light, to at least either of a higher-order mode and a radiation mode, or mode re-coupling means for re-coupling at least either of the higher-order mode and the radiation mode to the fundamental mode; and at least one output optical waveguide which outputs signal light; said mode coupling means or said mode re-coupling means

being an optical waveguide which has at least one of a core width and height varied irregularly continuously.

33. (Currently Amended) A planar lightwave circuit comprising an optical waveguide lens which has a core and a clad formed on a substrate, wherein the optical waveguide lens comprises: at least one input optical waveguide which inputs signal light; mode coupling means for coupling part of the inputted signal light to a higher- order mode and a radiation mode; mode re-coupling means for re-coupling the signal light coupled to the higher-order mode and the radiation mode by said mode coupling means, to output signal light; and at least one output optical waveguide for outputting the output signal light; said mode coupling means and said mode re-coupling means being optical waveguides each of which has at least one of a core width and height varied irregularly continuously.

35. (Currently Amended) A planar lightwave circuit comprising an optical branch circuit which has a core and a clad formed on a substrate, wherein the optical branch circuit comprises: one input optical waveguide which inputs signal light; mode coupling means for coupling part of the inputted signal light to a higher- order mode and a radiation mode; mode re-coupling means for re-coupling the signal light coupled to the higher-order mode and the radiation mode by said mode coupling means, to output signal light; and at least two output optical waveguides which output the output signal light; said mode coupling means and said mode re-coupling means being optical waveguides each of which has a core width varied irregularly continuously.

36. (Currently Amended) A planar lightwave circuit comprising a slab type coupler which has a core and a clad formed on a substrate, wherein the slab type coupler

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comprises: at least one, first input/output optical waveguide which inputs/outputs a light signal; an optical slab waveguide which is optically connected to the first input optical waveguide; and at least two, second input/output optical waveguides which are optically connected to said optical slab waveguide, and which input/output light signals; and that said second input/output optical waveguides comprise mode coupling means for coupling part of the inputted/outputted signal light to at least either of a higher-order mode and a radiation mode, and converting the coupled part into a plane wave at an end of said optical slab waveguide; said mode coupling means being an optical waveguide which has a core width varied irregularly continuously.

37. (Currently Amended) A planar lightwave circuit comprising an arrayed waveguide grating filter which has a core and a clad formed on a substrate, wherein the arrayed waveguide grating filter comprises: at least one input optical waveguide which inputs signal light; a first optical slab waveguide which is optically connected with said input optical waveguide; arrayed optical waveguides which are optically connected with said first optical slab waveguide, and which become longer with a predetermined waveguide length difference in succession; a second optical slab waveguide which is optically connected to said arrayed optical waveguides; and at least one output optical waveguide which is optically connected to said second optical slab waveguide; and that each of said arrayed optical waveguides comprises: mode re-coupling means for re-coupling a higher-order mode and a radiation mode to the signal light, at a part optically touching said first optical slab waveguide; and mode coupling means for coupling the signal light to the higher-order mode and the radiation mode, at a part optically touching said second optical

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slab waveguide; said mode coupling means and said mode re-coupling means being optical waveguides each of which has a core width varied irregularly continuously.

***Allowable Subject Matter***

3.1 The following is an examiner's statement of reasons for allowance:

Claims 25-37 are allowed for the following reason/s:

The instant application is deemed to be directed towards a non-obvious improvement over the invention patented in U.S. Patent No. 4415227 to Unger and U.S. Patent No. 5577141 to Adar.

3.2 Claims 25 and 33-37 are allowed because the prior art of record, taken alone or in combination, fails to disclose or render obvious a planar lightwave circuit having a core and a clad which are formed on a substrate, comprising a mode coupling means or a mode re-coupling means wherein said mode coupling means or said re-coupling means being an optical waveguide which has at least one of a core width and height varied irregularly continuously.

3.3 Claims 26-32 depend either directly or indirectly on Claim 25 and are thus also allowed.

3.4 Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3.5 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guy G. Anderson whose telephone number is 571.272.8045. The examiner can normally be reached on Tuesday-Saturday 1400-2200.

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- 3.6 If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Robinson can be reached on 571.272.2319. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
- 3.7 Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Guy G Anderson/  
Examiner, Art Unit 2883

/BRIAN M. HEALY/  
for Mark Robinson, SPE of Art Unit  
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